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(54) PROPELLER APPENDAGE

(54) APPENDICE D'HELICE

(57) Abstract:

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This invention relates to propellers, and more particularly to marine screw propellers having hub appendages, although I do not wish to be limited to such use for, as will hereinafter appear more clear, the invention is applicable to air propellers, for example.

The screw propellers in common use are usually fitted to the drive shaft by means of a taper and key and also a nut, the object of the latter being to prevent the propeller of the keyb from dropping off. In order to minimize or prevent the action of the water on the nut, it is customary, at least in larger installations, to provide a cap known as a fairwater, which is usually filled with grease or tallow in order to keep the parts watertight. The outline of this fairwater is purely arbitrary, consisting generally of a combination of arcs of circles, and being cast as light as possible has no function other than the protection of the nut and thread of the shaft.

In accordance with recent experiments, explaining to a degree the true nature of propeller action, it has been found that a hub appendage in the form of a fairwater can be made to perform an entirely different and more highly important function than hitherto known.

In the light of modern hydrodynamics, the action of a theoretically perfect propeller is controlled by a central vortex aft of the shaft, and resulting from the rotation of the propeller, which is fed either positively or negatively by fractional vortices, corresponding to each blade. In an actual propeller, where the blades may not be theoretically correct, the cylindrical space

between the central vortex and the surface described by the outer vortices may itself be filled with concentric vortex cylinders, just like the outer one, while, theoretically, it is possible to imagine a design such that the inner cylindrical space will consist of water moving in a non-vortical (potential) manner. At any rate, the greater the activity of the central core-vortex, the greater the "circulation" about each blade, from which results greater thrust and less danger of cavitation owing to increased velocity around the blade sections. This decrease in cavitation is, in itself, an important and attractive feature, and, so, too, increased thrust under fixed conditions as to diameter and R.P.M. is often of greatest importance. Again, this increased circulation effects a means to regulate the speed of the propeller, within certain limits, due to the loading thereof, more or less, above the power it would ordinarily consume. In other words, practical advantages arise with the increase of activity or circulation of the central vortex which immediately would be felt by all the blades, since the circulation about the blades is intimately linked with that of the central vortex. By my invention, then, I aim to provide a hub appendage which, when applied to a screw propeller, will increase the activity of circulation of the central vortex associated with the propeller, and thereby will increase also the circulation about each propeller blade, the sum of which circulations is closely united with that of the central vortex.

A further object is to provide a hub appendage for propellers which operates to regulate the speed thereof

within certain limits by loading it, more or less, due to increased circulation, above the power it would ordinarily consume.

A further object is to provide a propeller having a hub appendage, which appendage, when applied to a propeller, results in an increased thrust action and a decrease in the danger of cavitation of the same.

A further object is to provide a propeller having a hub appendage attaining the objects last above stated which is simple and cheap to manufacture and which can readily be adapted and applied to all existing screw propellers regardless of design or size.

Other objects and aims of the invention more or less broad than those stated above, together with the advantages inherent, will be in part obvious and in part specifically referred to in the course of the following description of the elements, arrangement of parts, combinations thereof, and application of principles constituting the invention; and the scope of protection contemplated will appear from the claims.

In the accompanying drawings, which are to be taken as part of this specification, and in which I have shown several preferred forms or embodiments of the invention - -

Figure 1 is an elevation of one form of my invention applied to a screw propeller of any design;

Figure 2 is a cross section along the lines 2-2 of Figure 1;

Figures 3 and 4 are views similar to Figures 1 and 2, illustrating a slightly modified form of construction;

Figures 5 and 6 show another form of hub appendage contemplated in my invention;

Figures 7 and 8 show a further modification; and

Figures 9 to 12, inclusive, represent other embodiments of a hub appendage.

Referring to the drawings, wherein the several reference characters denote corresponding parts, 10 designates a screw propeller having blades 11 and a hub 12 of the usual type, which is fitted to a shaft (not shown) and driven thereby. A hub appendage 13 of the form shown in Figure 1 is mounted aft of the hub 12 by suitable fastening means, such as the flange 14 and bolts 15 and has a portion of reduced diameter flaring outwardly to its main body diameter which is substantially the same as the diameter of the hub 12 or possibly a little greater. The length of the appendage can extend aft almost to the rudder post. As shown in Figure 2, the appendage may be made in the form of a casting, it being understood that plugs are provided for the holes 16 required in coring out the same. The exterior surface of the appendage 13 is trued up, but is left unpolished thereby to increase the activity of the central vortex in the propeller resulting from the friction of the appendage.

In Figures 3 and 4, light ribs 17 are provided on the outside of the hub appendage 13, which, under certain conditions, for instance, low speed, will yield more effect in the producing of an increased activity of the central vortex.

In the modifications shown in Figures 5 and 6, the hollow chamber of the hub appendage is eliminated, and the body portion thereof consists of ribs 18 which may be four, six or any suitable number, extending aft from the flange 14.

For high speed craft, where advantage can be gained from the suction present in the operation of the same, the modification shown in Figures 7 and 8 is especially applicable. The hub appendage 13 has its aft end open and has formed in its body portion longitudinal slots 20. The vacuum resulting from high speed will induce a certain amount of water to flow inwardly into the cylindrical appendage against the action of centrifugal force, thereby increasing the circulation of the surrounding water.

The hub appendage, as shown in Figure 9, might also be of advantage in special uses, this design being similar to that shown in Figure 7, but having a body portion flaring or extending rearwardly instead of being cylindrical throughout its length. In Figure 10 I have shown another form of appendage in which the body portion extends flush with the hub throughout its diameter rather than the portion of reduced diameter as shown in Figures 1, 3 and 6.

It will be seen that a large variety of modifications can be imagined in the application of a hub appendage of the type described as, for instance, the provision of spiral ribs or slots rather than ribs or slots parallel to the shaft, and all such modifications are comprehended within the spirit of my invention.

The type of hub appendage as hereinbefore described may be considered as of greater advantage in connection with single screws as it will help the circulation of the water broken up by the rudder of the craft and its post to collect before it reaches the propeller. It is to be understood that the hub appendage as described above is not to be limited to use with a marine screw propeller, although specifically applicable therewith, but may, with equal efficiency, and with the attainment of similar objects, be applied to air propellers and to helicopters.

From the above, it is evident that by the use of my hub appendage with a screw propeller an increase of the activity of the always existing central vortex of the surrounding water resulting from the rotation of the propeller is produced, which would be felt by all the blades due to the intimate union of the circulation about the blades and the central vortex. Further, it is seen that this boosting of the circulation is entirely dependent upon the friction or viscosity of the water and results in greater thrust of the blade and a decrease in the danger of cavitation thereof.

It is further evident that this increase of circulation serves to regulate the speed of the propeller by loading the same more or less above the usually consumed power, for, owing to the increased circulation, the blades will be carrying additional load, the amount of which can be regulated by the characteristics of the appendage such as diameter, surface thereof or the like.

The present type of appendage of similar character known as a fairwater, as is clearly seen from its outline, not only does not contribute to these results, but, by its very form, shows that the true action of the propeller screw is not correctly understood.

Inasmuch as many changes could be made in the above construction and many apparently widely different embodiments of my invention could be made without departing from the scope of the invention, it is intended that all matter contained in the above description or shown in the accompanying drawings shall be interpreted as illustrative and not in a limiting sense.

It is also to be understood that the language used in the following claims is intended to cover all of the generic and specific features of the invention herein described and all statements of the scope of the invention which, as a matter of fact, may be said to fall therebetween.

I claim:

1. In combination with a propeller, means operative to induce increased circulation of the central vortex associated with said propeller.

2. In combination with a propeller, means extending rearwardly thereof operative to frictionally increase the circulation of the central vortex associated with said propeller.

3. In combination with a propeller, means operative to induce increased circulation of the central vortex associated with said propeller, comprising an appendage axially mounted with relation to said propeller.

4. In combination with a propeller, means extending rearwardly thereof operative to induce increased circulation of the central vortex associated with said propeller, said means comprising an appendage axially mounted with relation to said propeller, said appendage having a body portion of a diameter substantially equal to the propeller hub.

5. In combination with a propeller, means extending rearwardly thereof operative to frictionally increase the circulation of the central vortex associated with said propeller, said means comprising an extended fairwater axially mounted with relation to said propeller.

6. In combination with a propeller, means extending rearwardly thereof operative to frictionally increase the circulation of the central vortex associated with said

propeller, said means comprising an extended fairwater axially mounted with relation to said propeller, said fairwater extension having a body portion of a diameter substantially equal to the propeller hub.

7. In combination with a propeller having a central hub, a member mounted on said hub and extending aft thereof and rotatable therewith, said member being operative to induce increased circulation of the existing central vortex associated with said propeller.

8. In combination with a propeller having a central hub, a member mounted on said hub and extending aft thereof and rotating therewith, said member being operative to frictionally increase the circulation of the existing central vortex associated with said propeller.

9. In combination with a propeller having a central hub, a member mounted on said hub and extending aft thereof and rotatable therewith, said member being operative to induce increased circulation of the existing central vortex associated with said propeller, said member having a diameter substantially equal to that of said hub.

10. In combination with a screw propeller having a central hub, a member mounted on said hub and extending aft thereof and rotating therewith, said member being operative to frictionally increase the circulation of the existing central vortex associated with said propeller, said member having a diameter substantially equal to that of said hub.

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11. A device of the character described, comprising an extended fairwater adapted to be mounted on the hub of a screw propeller and positioned aft thereof, and means on said fairwater extension adapted to induce an increased circulation of the existing central vortex associated with said propeller.

12. A device of the character described, comprising an extended fairwater adapted to be mounted on the hub of a screw propeller and positioned aft thereof, and means on said fairwater extension adapted to induce an increased circulation of the existing central vortex associated with said propeller, said fairwater extension having a body portion of a diameter substantially equal to that of said hub.

13. A device of the character described, comprising a member adapted to be mounted on the hub of a screw propeller and positioned aft thereof, and means comprising a frictional surface on said member adapted to induce an increased circulation of the existing central vortex associated with said propeller.

14. A device of the character described, comprising an extended fairwater adapted to be mounted onthe hub of a screw propeller and positioned aft thereof, and means comprising a frictional surface on said fairwater extension adapted to induce an increased circulation of the existing central vortex associated with said propeller, said fairwater extension having a body portion of a diameter substantially equal to that of said hub.

15. In combination with a propeller, means extending rearwardly thereof operative to induce increased circulation of the central vortex associated with said propeller.

16. In combination with a propeller, means extending rearwardly thereof operative to induce increased circulation of the central vortex associated with said propeller, said means comprising an appendage mounted with relation to said central vortex associated with said propeller, said means comprising an appendage axially mounted with relation to said propeller.

17. In combination with a screw propeller, means symmetrical with the centerline of the shaft thereof operative to induce increased circulation of the central vortex associated with said propeller.

18. In combination with a propeller, means for controlling the circulation of the individual blades of the propeller through controlling that of the central vortex associated with the propeller.

19. In combination with a propeller, means for controlling the circulation of the individual blades of the propeller through controlling that of the central vortex associated with the propeller, said means being operative to control the thrust and load characteristics of the individual blades of the propellers.

20. In combination with a propeller, means comprising an appendage revolving in the same direction as, and concentric with, the shaft of the said prppeller, said means operative to induce increased circulation of the central vortex associated with said propeller.

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Fig. 1.

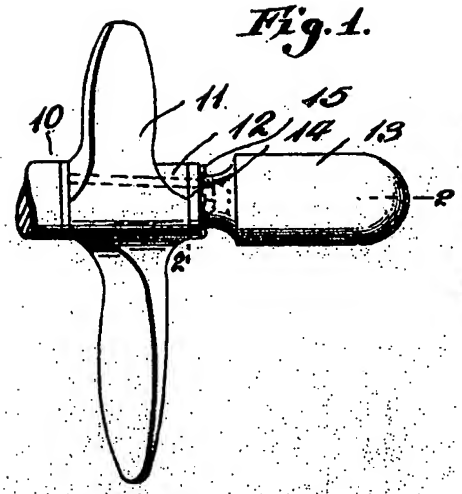


Fig. 2.

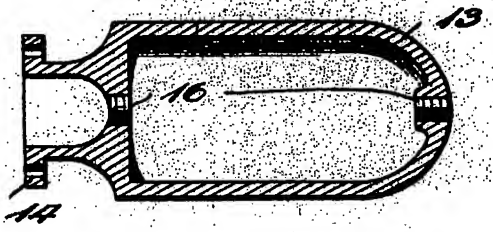


Fig. 3.

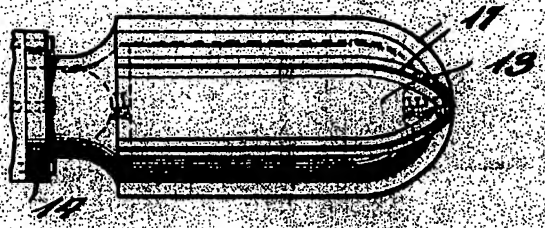
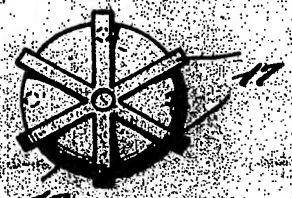


Fig. 4.



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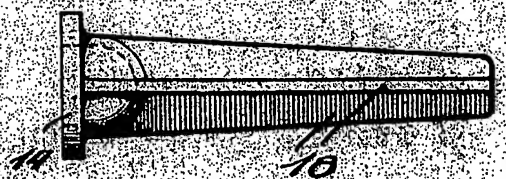
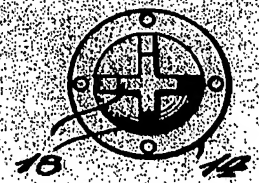


Fig. 6.



Certified to be the drawing referred to in the specification hereunto annexed.

January 17 1924

Washington D.C.

APPLICANT

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Fig. 7.

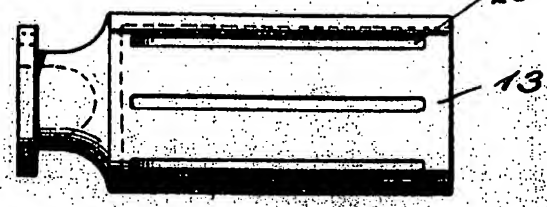


Fig. 8.

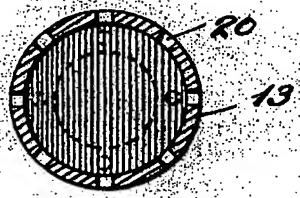


Fig. 9.

Fig. 11.

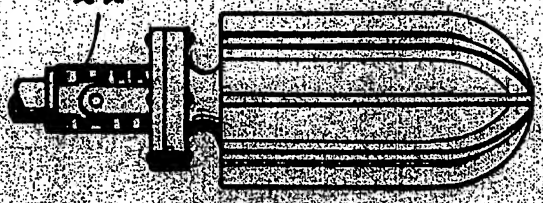


Fig. 10.

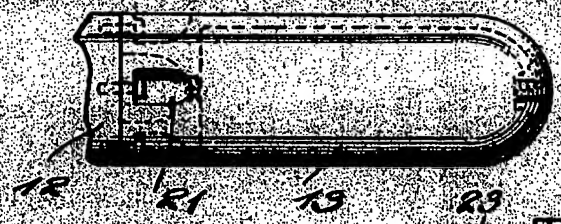
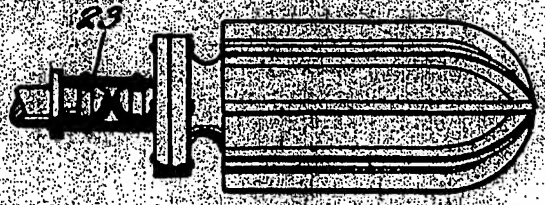


Fig. 12.



Certified to be the drawing referred to in the specification hereunto annexed.

July 17 1924

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